TIGER BEETLES of the GENUS *CICINDELA* in SOUTHWESTERN NEVADA and DEATH VALLEY, CALIFORNIA, and DESCRIPTION of TWO NEW SUBSPECIES

(COLEOPTERA - CICINDELIDAE)

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The tiger beetles of Death Valley, Inyo and San Bernardino counties, California, and regions associated with the Amargosa River in Nye county, Nevada, are still relatively unknown. The author has devoted many of his spare moments to the observation and study of these populations wherever found in this vast remote region of the Great Basin. Though much work remains to be done, it appears appropriate at this time to publish some of the results of those efforts. Sincere appreciation is hereby expressed to both Dr. Mont A. Cazier whose advice and encouragement have been most helpful, and Mr. F. W. Binnewies, superintendent of the Death Valley National Monument, whose permission made possible the accumulation of all Death Valley specimens.

The first part of this paper deals with Death Valley populations. Five subspecies of tiger beetles of the genus *Cicindela* have so far been identified with Death Valley, and collected specimens at hand have verified their existence in this region. These are:

C. willistoni pseudosenilis W. Horn 1900, Ent. Nach. XXVI, p. 218

C. amargosæ amargosæ Dahl 1939, Bull. Brook. Ent. Soc., vol. XXXIV, p. 221

C. californica erronea Vaurie 1951, Amer. Mus. Nov., no. 1479, p. 12

syn. *C. californica viridicyanea* Vaurie 1950, Amer. Mus. Nov., no. 1458, p. 1

C. nevadica nevadica LeConte 1875, Trans. Amer. Ent. Soc., V, p. 159

C. hæmorrhagica hæmorrhagica LeConte 1851, Ann. Lyc. Nat. Hist. N. Y., V, p. 171

The following subspecies has been reported from Nevada and Death Valley (Cazier 39: 27), but its actual existence in the Valley has not been verified:

C. denverensis propinqua Knaus 1922, Journ. N. Y. Ent. Soc., XXX, p. 194

The information made available here on the *Cicindela* fauna of Death Valley is based on the populations found in two areas located approximately 80 miles apart.

I. The one area is located on the eastern edge of the Valley's alkali sink, and is divided into two sites:

a. One site is seven miles north of Furnace Creek, extending both north and south of this point for some distance, at an elevation of 260 feet below sea level. Here, natural springs known as Salt Springs drain almost the year around in long rivulets which flow generally westward into the open alkali flats. Alkali-resistant grasses grow thickly at the edge of these flats, except in drainage areas where the ground is relatively free of grass and alkali.

b. The other site is along the southern end of Salt Creek, 17 miles north of Furnace Creek, at an elevation of 200 feet below sea level. Here, this permanent section of the creek fans out and disappears underground leaving extensive sand bars exposed.

II. The other area is located across the normally dry Amargosa River bed, one quarter mile west of Saratoga Springs in San Bernardino county, California, nearly 75 miles south of Furnace Creek. This area extends for several miles to the north of Saratoga Springs, on a gradual down-hill slope from an elevation of 200 feet. At this location the river bed is made up of numerous channels through alkali and sand bars, covered here and there with short grasses. The footing usually reveals dampness just below the surface. At some places pools of water are found which sometimes contain fishes of the genus *Cyprinodon*.

Several other places were visited on occasion in quest of *Cicindela*, but no beetles were found. These places include Stovepipe Wells, upper Salt Creek, areas around the few masonry covered wells in the middle Valley, Tule Spring, Badwater, and pools to the south which are permanent bodies of water so surrounded by salt incrustations that tiger beetles cannot live in the vicinity. Other likely habitats are at the ruins of the old Eagle Borax Works, at Furnace Creek Ranch, and along the waterway east of Furnace Creek Inn.

A closer examination of the site seven miles north of Furnace Creek reveals that all five subspecies occupy it. Though as many as four of these may be found at any one time, it appears that each

dominates the site in turn, indicating that some balance has been reached in their competition for this limited living space. They appear as follows:

I. A population of *C. willistoni pseudosenilis* is the first to make its appearance. Individuals of this population prefer the damp flats at the western edge of the grassy area, and occasionally may be found far out on the alkali flats. Specimens are always a constant dark green or blue-green, with white maculation; the lunules are always present, usually complete, and in many individuals more narrow than is found in Owens Lake samples. This population and the next compete for the site on fairly even terms at nearly the same time; they have also been found together in November. Observation indicates that ssp. *pseudosenilis* takes cover on very windy days, when wind velocities approach 30 miles per hour and up.

II. The next population seen is one of *C. amargosæ amargosæ*. This is treated here as a distinct species, and not as heretofore when it was known as a subspecies of *C. willistoni*, for such sufficient reasons that two distinct subspecies of the same species cannot exist sympatrically, that no interbreeding with ssp. *pseudosenilis* has ever been observed, and that no hybrids have ever been found; this is in general agreement with the original observation by Dahl (39:222). It will be shown later that *C. amargosæ* is polytypic. Individuals are very numerous in April; by mid-May they are seen in reduced numbers, but still mating; by June they disappear. They invade the grassy area where the ground is moist and darkest; they are most numerous where the waters of the springs drain off, and are frequently seen standing in the very shallow spots, often mating in this surrounding. Visual evidence indicates that they are more active on overcast or partly cloudy days, possibly because they live, as a rule, among the alkali-resistant grasses where some shade may be obtained. They will appear when the wind velocity is very high. Their color is a medium dark shade of green or blue-green in April, becoming darker in May but never black as in some Nevada specimens. Their elytra are very hard and brittle, becoming more so as the season wears on. This site, or one slightly to the south, is the type location of this subspecies. It has not been found at any other location.

III. The third population to be seen is of subspecies *C. californica erronea.* This is the first mention of this new location in California for this striking blue and green subspecies, which heretofore was known only from the vicinity of Willcox, Cochise county, Arizona (Vaurie 50:1). Individuals are first seen in mid-April; by the beginning of May they take over the site in large numbers. In the early period of their emergence they are competing for space with ssp. *amargosæ,* and are then found mostly along the shallow streamlets in open spots away from the grassy area. When they predominate they close in to the edge of the grasses where there is flowing water. They frequently walk in the shallow water where they too do not hesitate to mate.

IV. *C. nevadica nevadica* makes up the fourth population to appear. This sub-species so common at Ash Meadows in Nevada, has never before been reported from Death Valley. Individuals emerge in the latter part of April, from a few to increasing numbers by May. They disappear in June when the water at this site recedes to a few isolated puddles. These unusually wary *nevadica* blend well with their background, invading by preference the edges of water runs where the sand is exposed and reasonably free of alkali. They are rapid runners and short flyers. From mid-April to mid-May, populations of the above four subspecies may be found in greater or lesser numbers at this site.

V. The final population to emerge is composed of *C. hæmorrhagica hæmorrhagica.* Adults appear at the end of May and probably outlast all the other populations. At that time this same subspecies is commonly found throughout Southern California and some parts of Nevada. Individuals from Death Valley appear to be fully maculated.

At the Salt Creek site only two subspecies have been observed. *C. willistoni pseudosenilis* was collected in May, after it had disappeared from the site seven miles north of Furnace Creek. At the same time *C. nevadica nevadica* was as plentiful here as in the populations above Furnace Creek.

The author has not visited the Saratoga Springs area of Death Valley as frequently as the Furnace Creek area because of the greater distance involved and the general poor condition of the roads south of Badwater. The populations found here include *C. willistoni pseudosenilis, C. californica erronea,* and *C. nevadica nevadica. C. amargosæ* does not appear at this location in any

form, and it is surprising that even hybrids have not been encountered. The ssp. *pseudosenilis* population differs from the northern population in that the maculation is still more reduced, with a few immaculate or nearly immaculate individuals appearing in any sample. A much more extensive population of *C. californica erronea* may be observed here, with the individuals usually lurking among the grasses, but not hesitating to appear in the open; when water is present they will walk into the shallower spots; they are not very wary, and can be approached very closely. *C. nevadica nevadica* is also very common at this location, and is always found on the alkali-free mud or sand bars, usually where it is wet and water is exposed.

A few miles upstream of Saratoga Springs, the Amargosa River makes a wide turn where it reverses its course from the northwest as it comes out of Inyo county. Here, along the river bed at Shoshone, California, and extending a few miles south of the town, there is a new subspecies of *C. willistoni* that exhibits a nearly constant reduction in maculation and size.

Cicindela willistoni prædicta, new subspecies

Medium size, narrow and convex, head and prothorax green; elytra blackish-blue, immaculate except for two small vaguely marked apical spots. Head and prothorax as in subspecies *echo* except that the basic color is green, with only faint highlights of bronze; impressions of the prothorax deep and colored blue; second joint of male palpi pigmented; antennae slender, the first four joints green. Elytra coarsely and fairly evenly punctured, with slightly heavier punctures in the impressions; they broaden evenly from the shoulder to the apical two-thirds; there are no humeral or median lunules, and the apical are reduced to vestigial crescents near the suture. Underside brilliant blue, clothed with white decumbent hair; femora blue with green joints, tibae green. Male—length 11.1 mm, width 4.4 mm. Female—like the male except for larger size and broader proportion; length 11.4 mm, width 5.0 mm.

Holotype male, allotype female in the author's collection. Collected at the type location 3.5 miles south of Shoshone, Inyo county, California, on April 17 and April 8, 1956 respectively. 55 paratypes collected as follows: Shoshone, April 3, 1955 (1), April 18, 1955 (5); 3.5 miles south of Shoshone, April 18, 1955 (9), April 7, 1956 (11), April 18, 1956 (11); Carson Slough, Ash Meadows, Nye county, Nevada, March 18, 1956 (1), April 8, 1956 (3), May 5, 1956 (14).

A distribution of paratypes was made as follows: 2 to Dr. Mont A. Cazier of the American Museum of Natural History, and 2 to Dr. E. S. Ross of the California Academy of Sciences.

Type location: 3.5 miles south of Shoshone, Inyo county, California, in the Amargosa River bed. At this location the river bed is broad and the water, which is usually present, breaks up into numerous parallel rivulets which cut narrow meandering paths through the alkali beds. A type of brownish alkali-resistant grass grows in clumps and patches in this area. The type location is along the westernmost waterway. This gregarious population is restricted to a narrow band only a few feet wide and not over 150 feet long. Upon leaving this small strip, the appearance of *C. denverensis propinqua* may be noticed. The leached out crust of salt and alkali is very white and nearly one half inch thick; underneath, the ground is brown and moist. The adults hide under this crust. On very windy days they may be seen walking on the alkali where they are readily noticed; though they are good flyers, usually flying short distances at one time, they are rarely seen taking to the air during windy weather, a characteristic typical of *pseudosenilis* and *echo*-like populations. In May this population is easily confused with the dull colored ssp. *propinqua* population which intermixes with it.

At Ash Meadows, along Carson Slough, the ssp. *prædicta* population is restricted to an area a few feet wide by not over 200 feet long; adjacent to this area may be found both ssp. *propinqua* and *amargosæ* hybrids.

The *prædicta* populations exhibit the same extreme reduction in maculation observed in other *Cicindela* groups of the upper Amargosa River region. The absence of maculation is not constant, varying from completely immaculate individuals to a few narrowly maculated individuals quite like those of Death Valley populations. A comparison of length in various populations of ssp. *echo*, *pseudosenilis*, and *prædicta* indicates that there is a nearly continuous reduction in size with distance, as shown in Table A.

sub-species	population	sample size			longest	shortest	average length (mm)			s
		n	♂	♀	(mm)	(mm)	$\bar{X}$	$\bar{X}$ ♂	$\bar{X}$ ♀	
echo	Great Salt Lake	12	9	3	12.6 ♀	10.8 ♂	11.86	11.78	12.10	.28
	Koehn Lake	26	14	12	13.6 ♀	11.3 ♂	12.20	12.00	12.50	.39
pseudosenilis	Owens Lake	30	15	15	13.4 ♀	10.3 ♀	12.05	11.85	12.26	.66
	Furnace Creek	30	15	15	12.9 ♀	10.8 ♂	11.80	11.60	12.00	.42
	Saratoga Springs	19	10	9	12.1 ♂	10.6 ♂	11.40	11.40	11.32	.42
prædicta	Shoshone	15	10	5	12.2 ♀	10.5 ♂	11.27	11.10	11.66	.40
	Ash Meadows	18	10	8	12.0 ♀	11.0 ♀	11.59	11.47	11.70	.24
total		130	83	67						

TABLE A[1]

Comparison of Length in Various Populations of *C. willistoni echo, pseudosenilis,* and *prædicta.*

Subspecies *prædicta* cannot be readily differentiated because of its smaller size, as size may vary because of the effect on the larvae of yearly rainfall, temperature gradients, and food supply. Color differences in the *willistoni* complex may be significant since they appear to be explainable by the degree of hybridization and

1. The algebraic formula for the calculation of variance used in this paper is:

$$s^2 = \left[\sum(x^2) - \frac{\left(\sum x\right)^2}{n}\right] \Big/ n - 1$$

where the square root of the variance is termed the "estimated standard deviation", and is denoted by the letter s. The $\bar{X}$ (x bar) denotes the average, or mean, of the individual measurements X considered in n samples.

isolation of the various populations. However, a more reliable method is comparison of the degree of maculation with the nearest populations, as shown in Table B.

Type of elytral maculation	Average % coverage	number in population / Ash Meadows	Shoshone	Saratoga Springs	Furnace Creek	Owens Lake	Koehn Lake	Great Salt Lake
confluent	31						6	
broad	21				3	5	17	3
medium	14			7	51	52	2	9
narrow	9	3	1	6	8	2	1	3
reduced	6		1	4	5			
spotted	3	5	8		1			
immaculate	.2	10	29	2				
total population sample		18	39	19	68	59	26	15
average % coverage, $\bar{X}$		2.4	1.2	9.3	12.9	14.4	22.3	14.4

TABLE B

Comparison of Percentage of Maculation Coverage in various Populations of the *C. willistoni* complex.

By this it can be shown that the Shoshone population of ssp. *prædicta* is significantly different from the population of Saratoga Springs. The Saratoga Springs population is more nearly similar to the northern populations of Death Valley and is therefore to be included with ssp. *pseudosenilis*. The dark blue-black color influence of ssp. *prædicta* is observed in all Death Valley and Owens Valley populations, decreasing with distance, while the

degree of maculation increases steadily. Subspecies *prædicta* may have once populated the shores of ancient Lake Tecopa, the Amargosa River into Ash Meadows, and even the connecting river into ancient Lake Pahrump which filled the valleys to the east between the Spring and Nopah Mountains. That still better defined immaculate representatives of the parent stock still exist in that area is a good possibility. Hybridization with the ancestral *echo* seems to have occurred in two directions, namely southward via the Amargosa River through Death Valley to the Owens Lake basin, and northward along a path now too indistinct to trace. This would explain in part why the Ash Meadows population exhibits more joint overlap with ssp. *pseudosenilis* than does the Shoshone population.

The Koehn Lake (Saltdale) population from Kern county, California, is placed with ssp. *echo* because it is hardly influenced by blue coloring, and bears much wider maculation. This indicates the possibility that ssp. *prædicta* intruded on the ssp. *echo* populations during one of the last pluvial periods, and that Koehn Lake, though not linked with the Death Valley System during that period, was connected to it during an earlier period.

C. nevadica nevadica is present at all locations in the vicinity of Shoshone. At Tecopa and Tecopa Hot Springs, located in Inyo county, eleven miles southeast of Shoshone, *C. denverensis propinqua, C. nevadica nevadica,* and *C. hæmorrhagica hæmorrhagica* were noticed during the month of May.

In Nye county, Nevada, between Beatty and Springdale, at an elevation of about 3400 feet, the highway passes through alkali beds, intermittent streams, and damp meadows which constitute the normal channel of the upper Amargosa River. This is about 110 miles upstream of Saratoga Springs, or 190 miles from the location near Furnace Creek by following the river channel; by road it is only 44 miles from Furnace Creek, but separated by the Funeral Range, which may be crossed at Daylight Pass. This mountain range and other lesser ranges to the east form a barrier that effectively separates the tiger beetles of both locations. Four populations of the genus *Cicindela* live sympatrically in this upper region of the Amargosa River, and are:

C. tranquebarica kirbyi LeConte 1866, Proc. Acad. Nat. Sci. Phila., p. 362.

C. amargosæ nyensis, a new subspecies described below.

C. pusilla imperfecta LeConte 1851, Ann. Lyc. Nat. Hist. N.Y., V, p. 171.

C. nevadica nevadica LeConte 1875, Trans. Amer. Ent. Soc., V, p. 159.

The first populations are observed in late March and early April, and consist of *C. tranquebarica kirbyi* with ever increasing numbers, until mid-May, and *C. amargosæ nyensis* new subspecies, which is most abundant in April.

Cicindela amargosæ nyensis, new subspecies

Medium small in size, sericeous, black above with very faint green reflections in the muricate wrinkles of the prothorax and scutellum, and still fainter blue traces in and around the punctures of the disk of the elytra. Sparse hairiness above, consisting of a few hairs in line near the lateral edges of the prothorax, and a few scattered hairs on the frons; beneath rather densely hairy. Head and prothorax as in ssp. *amargosæ* but smaller, and labrum relatively shorter; color uniformly black with very faint blue-green reflections in the rugosity of the prothorax; the deeper transverse impressions of the head and prothorax have stronger blue and green tinges. Elytra glabrous, sides widest at apical third as in ssp. *amargosæ*, then evenly rounded to apex; sericeous, black, with impressions faintly bluish, and purplish coloration near the base of the elytra; the small roughly triangular apical spots are very small. Underside is of a uniformly polished dark blue, the hairs are placed as in ssp. *amargosæ*. Legs black with faint green reflections that become bluish near the joints. Male—Length 10.4 mm. width 4.2 mm. Female—same as the male except for larger size and wider proportion; length 10.9 mm., width 4.9 mm.

Holotype male, allotype female in the author's collection. Collected April 16, 1955 with 48 paratopotypes, and an additional 106 paratopotypes collected on April 23, 1955. A distribution of paratypes was made as follows: 22 to Dr. M. A. Cazier of the American Museum of Natural History, 4 to Dr. E. S. Ross of the California Academy of Sciences, 2 to Dr. F. S. Truxal of the Los Angeles County Museum, 2 to Dr. W. J. Brown of the Canadian Department of Agriculture, and 2 to the Reverend B. Rotger of Pagosa Springs, Colorado.

Type location: 1.6 miles south of Springdale, Nye county, Nevada; in the Amargosa River bed, along mud flats at the edge of small rivulets, in patches of short grasses. The individuals live among these grasses and are readily flushed. They are reasonably wary, but their flight is weak and short. They are not as robust as ssp. *amargosæ*, and their elytra are much softer. The ssp. *nyensis* population differs from ssp. *amargosæ* by the black color which bears faintly colored reflections that are visible only under magnification, by the apical maculation that is more reduced, and by the smaller size. A comparative analysis of length, which is

one of the obvious differences, was made between a series of 50 ssp. *nyensis* and a series of 69 typical ssp. *amargosæ* from near Furnace Creek, Death Valley, California. The results of these measurements are shown in Table C.

ssp	population	sample size			longest (mm)	shortest (mm)	average length(mm)			s
		n	♂	♀			$\bar{X}$	$\bar{X}$ ♂	$\bar{X}$ ♀	
amargosæ	Furnace Creek	69	23	46	13.4 ♀	10.7 ♀	12.0	11.4	12.2	.65
nyensis	Springdale	50	23	27	11.9 ♀	9.4 ♂	10.7	10.4	10.9	.49
	total	119	46	73						

TABLE C

Comparison of Length in Populations of
C. amargosæ amargosæ and *nyensis*.

The report by R. G. Dahl (40:79-80) indicates that *amargosæ* specimens collected in northwestern Nevada and nearby areas of California show variable color patterns between black, green, and bronze. In a letter to the author (1954) M. A. Cazier mentions that at Gerlach and other places in northern Nevada the population samples run about fifty-fifty green and black. This would indicate that there are extensive hybrid populations. At Ash Meadows, Nevada, approximately 50 miles downstream of the *nyensis* type location, at the edge of a connecting stream known as Carson Slough, the author has collected individuals from a hybrid population that show characteristics of both subspecies, and at their extremes are indistinguishable from typical ssp. *amargosæ* and typical ssp. *nyensis*. The hybrid area lies between the type locations of both subspecies, along the Amargosa River which nearly connects all three populations. The population of ssp. *amargosæ* near Furnace Creek is constant in its larger size and maculation, and medium green color. This latter location is not a part of the Amargosa River drainage system as reported

(Dahl 39:222), but of the Salt Creek system which flows south from near Lida, Nevada; both systems meet at Badwater some 30 miles south of the type location of ssp. *amargosæ*. Since the two systems rarely flow simultaneously, it is quite probable that the two subspecies are now totally allopatric. Furthermore, from the lack of ssp. *amargosæ* at Saratoga Springs, it appears that the hybrid population of Ash Meadows has become completely isolated from the parent stocks in recent times.

In May and June, *C. pusilla imperfecta* is present in great numbers near Springdale. The color of this subspecies is bright blue and blue-green. Individuals of *C. nevadica nevadica* may also be found near Springdale at the same time.

Ash Meadows is located northeast of Death Valley Junction, California, and lies mostly in Nye county, Nevada, between the Amargosa Desert and the Resting Springs Mountains, at an average elevation of about 2200 feet. Five subspecies of *Cicindela* have been found there, scattered in greater or lesser populations wherever water is most abundant and permanent. These are:

C. denverensis propinqua Knaus 1922, Journ. N.Y. Ent. Soc., XXX, p. 194 syn. *C. arida* Davis 1928, Pan-Pac. Ent., vol. V, no. 2, p. 65.

C. willistoni prædicta, new subspecies.

C. amargosæ hybrids *(amargosæ* X *nyensis).*

C. nevadica nevadica LeConte 1875, Trans. Amer. Ent. Soc., V, p. 159.

C. hæmorrhagica hæmorrhagica LeConte 1851, Ann. Lyc. Nat. Hist. N.Y., V, p. 171.

Not found by the author are *C. punctulata punctulata* Oliv., *C.* var. *chihuahuæ* Bates, and *C. tenuisignata* Lec., all reported by W. Knaus (22:194-195). The existence of *tenuisignata* in Ash Meadows is very probable in the opinion of this author, but he ventures that there was some confusion in reporting the existence of ssp. *punctulata* and ssp. *chihuahuæ* in this region. The populations were observed as follows:

I. The first populations noted at Ash Meadows are those of *C. denverensis propinqua, C. willistoni prædicta,* and *C. amargosæ* hybrids. Subspecies *propinqua* has been encountered as early as March along Carson Slough, from Nevada into California, also at Bole Spring and near Ash Meadows Lodge, both in Nevada. The type location for ssp. *propinqua* is in the northern part of the Meadows in the drainage area of Fairbanks Springs, at the

headwaters of Carson Slough. This unusually bright green *Cicindela* may be doubtfully classed as a subspecies of *C. denverensis* as originally reported (Knaus 22:194) and later verified by Nicolay and Weiss (32:352), and Davis (29:100), but it is this author's opinion that it is a close relative of the *purpurea* group, and that alliance to *tranquebarica* (Horn 30:81, Cazier 39:37) will stand review. Of 118 individuals collected in March and early April 1955, only 3 could be called muddy green as reported by A. C. Davis (28:65) in his description of the synonymous *C. arida;* but the May specimens are nearly all muddy green. Many of the early individuals possess brilliant coppery reflections that could class them among our most beautiful tiger beetles; unfortunately, this brilliance fades within a few days after death to the basic bright green, with only a few specimens retaining a small measure of their former brilliance. Subspecies *propinqua* prefers the whitest alkali flats at the farthest edge of streams and damp places. These areas are always sparsely covered with alkali-resistant grass stubbles. The individuals hide under these grasses, and when flushed make one long flight into the open where they may be easily caught. They generally stay fairly apart from each other over an extended area; a considerable amount of walking is necessary to net a few. Specimens were collected under the same conditions at Shoshone, Inyo county, California, in the bed of the Amargosa River, along with ssp. *prædicta.*

II. *C. nevadica nevadica* reaches its greatest population count in Ash Meadows. Individuals have been located at Springdale, Nevada; Death Valley, Inyo and San Bernardino counties, and as far west as Saltdale (Koehn Lake), Kern county (Cazier 37:117), and Saline Valley, Inyo county, California; but they have never been seen in the numbers encountered at Ash Meadows in June and July. While staying at Ash Meadows Lodge one evening in June of 1954, the author found ssp. *nevadica* swarming at lights and had to shut the door to his room to keep them out. They have been collected at several places in Ash Meadows, always near water. When out in numbers they are easy to collect as their flight is short, usually from one side of a stream to the other. Their color is brown over a green background. They prefer open ground where they blend well with their surroundings, while avoiding alkali covered areas.

III. *C. hæmorrhagica hæmorrhagica* is not uncommon at Ash Meadows from June onward. It prefers muddy areas where the ground is darkest, always at the edge of water. Individuals vary from fully maculated to coal black, all within the same population.

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